

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

POTATO "NUTS"
A NEW TYPE OF SNACK

NOVEMBER 1956

POTATO "NUTS" -- A NEW TYPE OF SNACK

James Siciliano, C. F. Woodward, R. H. Treadway, and E. G. Heisler
Eastern Regional Research Laboratory¹
Philadelphia 18, Pennsylvania

Some developmental work has been done recently on deep-fat-fried potato cubes with the purpose of preparing a crunchy food that could be eaten either as a snack or as a crouton. This is not the first time that a product of this sort has been envisioned or even produced. Shortly after the close of World War II, companies in Maine and Idaho produced for a while a snack prepared by frying dehydrated potato pieces. Potato sections 3/8 by 3/8 by 1/4 inch were dehydrated to 12 percent moisture content and then fried to give an end product containing about 20 percent fat. This product, under ideal conditions, was rather porous and brittle in structure. Its texture was somewhat like parched corn. However, some pieces contained hard, compact areas that were difficult to chew and even presented a hazard to dental repair work. It is believed that the production and distribution of this type of potato "nuts" were stopped principally because of the problem of hard areas in the pieces.

INITIAL LABORATORY EXPERIMENTS

The Eastern Regional Research Laboratory embarked on a study of potato "nuts" at the suggestion of Mr. A. K. Gardner, Consultant of the Maine Potato Tax Committee in the field of processing, and Dr. M. E. Highlands of the Maine Agricultural Experiment Station. Commercially dried potato dice (3/8 by 3/8 by 1/4 inch) were first tried as raw material. The dried dice were reconstituted in boiling water for 2 to 5 minutes to give pieces containing 48 to 60 percent water. The partially reconstituted dice were then fried at 325° F. for 1 minute. The fried product in every case was hard and horny. Steam reconstitution of dried dice was attempted but browning occurred without any appreciable water uptake.

Potato "nuts" of the type formerly produced commercially were prepared according to directions supplied by Mr. Francis Saunders of H. C. Baxter and Brother Company, Corinna, Maine². Raw potatoes were sliced into dice approximately 3/8 by 3/8 by 1/4 inch. The dice were blanched in steam for 1 minute and dried in a forced-draft oven for successive 20-minute periods at the following temperatures: 220°, 180°, and finally at 145° F. The dried dice were then allowed to equilibrate at room temperature in the open for 20 hours. Following this, they were fried at 325° F. for 1 minute. When immersed in the hot fat, the pieces had a tendency to pop like corn; however, the popping was not sufficient to give a crunchy texture. The structure was still rather hard and horny.

¹ A LABORATORY OF THE EASTERN UTILIZATION RESEARCH BRANCH, AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE.

² MENTION OF COMPANY NAME DOES NOT IMPLY ENDORSEMENT BY THE USDA OVER OTHERS NOT MENTIONED.

DIRECT FRYING OF FRESH POTATO CUBES

The best results were obtained when fresh potatoes were sliced into 1/4-inch cubes and fried directly. Larger dice resulted in fried pieces having soft center. Cubes smaller than 1/4 inch on a side tended to become excessively brown and hard on frying and would be difficult to process commercially. Frying time and firmness of centers are influenced by the total solids content of the potatoes used, which ranged from 17.5 to 22 percent. No study was made of possible product differences due to potato variety, but good quality "nuts" were prepared from Maine Katahdin and Idaho Russet Burbank potatoes, the only varieties used. Potato "nuts", like chips, have best color, taste, and texture if made from potatoes of low sugar content.

FRYING CONDITIONS

A thermostatically controlled electric fry kettle of 15-pound fat capacity was used. Peeled potatoes were sliced by a single pass through a power-driven vegetable dicer, washed to remove surface starch, drained, and then added to fat at 320° F. A charge of 2-3/4 pounds of potato dice was used in the 15 pounds of fat. The dice were contained in a reinforced wire-mesh frying basket and stirred frequently during a 10-minute frying period. In commercial practice, the processor probably would want to operate at a higher frying temperature and for a shorter frying cycle than was used in this laboratory study. The temperature of the frying bath fell from the initial 320° F. to about 265° F. shortly after the charge was added, and then slowly increased to 320° F. Immediately after completing the frying, the cubes were centrifuged for about 10 minutes at 2,000 r.p.m. to remove excess surface fat. Centrifuging produced more attractive pieces because of their "drier" appearance and freedom from a greasy feel in the mouth. These experimental conditions were used for the preparation of 20 pounds of potato "nuts" for demonstration purposes at the United Fresh Fruit and Vegetable Association's annual meeting held in New York City in January 1955.

Only two kinds of fat were used in this experimental work: Cottonseed oil and hydrogenated vegetable shortening. Samples fried in cottonseed oil seemed to have a slightly drier appearance, but little difference in flavor could be detected between samples prepared in these two fats. Potato "nuts" prepared by our method contained 26 to 28 percent fat and 6 to 8 percent moisture.

FACTORS IN OBTAINING CRISP TEXTURE

In preparing potato "nuts", we stop the frying when the cubes are browned to the desired extent although the oil bath is still frothing due to ebullition of the water. Freshly fried cubes are crisp at the surface and firm at the center. They apparently lose moisture during cooling. If packaged while warm, moisture commonly condenses on the inner walls of the package and the pieces become tough and chewy probably because of migration of moisture from the interior to the surface crust. Hence, it is believed that potato "nuts" should be allowed to cool in a dry atmosphere before packaging. There are indications, as a result of a few experiments, that it might be well to conclude the processing by a step in which the potato "nuts" are heated in an oven.

This would drive additional moisture out without the necessity of frying until the pieces are overly browned. We do not at present have information on the optimum moisture content to which potato "nuts" should be fried or dehydrated, either from the standpoint of the quality of the freshly prepared product or of its storage properties.

FURTHER DEVELOPMENTS

Further developmental work on potato "nuts" is being conducted by the Maine Agricultural Experiment Station. Evaluation of the suitability of Maine potato varieties and further appraisal of the commercial potential of potato "nuts" are included in this program.